

Comparative Evaluation of the Efficacy & Pain Perception using Four Types of Orthodontic Separators

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Abstract

To evaluate the amount of separation produced by four types of orthodontic separators viz. the elastomeric separator, Kesling separator, Kansal separator and Dumbbell separator and determine the patient's perception of pain and discomfort caused by these four types of separators. Evaluate the time taken to achieve adequate separation and record the number of different separators lost. Time taken for adequate separation was significant in all the 4 separators; dumbbell being the fastest followed by elastomeric separator.

Keywords: Visual analogue scale (VAS), Reproximation, Hyalinised, Questionnaire, ANOVA

INTRODUCTION

Separators are used in dental practice to create a space usually between molars prior to placement of orthodontic bands and crown restoration. A separator is considered ideal if it is easy to place, radiolucent, provides sufficient separation with minimum pain and discomfort, with minimum or no loss after placement.¹

Pain and discomfort² due to separator placement is the most common chief complaint of the patients and one of the reasons for avoiding orthodontic treatment^{3, 4}. Since, there is limited research data⁵ available on orthodontic separators; our study was designed to compare efficacy of different separators.

AIMS AND OBJECTIVES

The aims and objectives of our study were

- 1) To evaluate the amount of separation produced by four types of orthodontic separators viz. the elastomeric separator, Kesling separator, Kansal separator and Dumbbell separator.
- 2) To evaluate the time taken to achieve adequate separation
- 3) To determine the patient's perception of pain and discomfort caused by these four types of separators.
- 4) To record the number of different separators lost

MATERIALS AND METHODS

The study population consisted of 40 subjects (20 girls and 20 boys) in the age range of 12-16 years. The subjects were randomly selected from patients visiting the Department of Orthodontics and Dentofacial Orthopedics Mahatma Gandhi Dental College & Hospital, Jaipur, Rajasthan. The ethical clearance for the study was obtained from Institutional Ethical Committee of Mahatma Gandhi Dental College and Hospital, Jaipur.



Fig. 1: Different Separators and Separator Placing Plier

Method of Collection of Data

The above mentioned four separators were placed alternately in four different quadrants in each patient to avoid right and left and maxillary and mandibular bias. Kansal and Kesling separators were placed using a light wire plier, Elastomeric and Dumbbell separator were placed using a separator placing plier and straight howe plier (Fig-3 and fig-4). The patient was

INCLUSION CRITERIA

- 1) Healthy patients requiring fixed orthodontic treatment in maxillary and mandibular arches with no systemic disease.
- 2) Patients with bilaterally tight contact between 2nd premolar, 1st molar and 2nd molar.
- 3) Healthy periodontium
- 4) Fully erupted mandibular second molar

EXCLUSION CRITERIA

- 1) Patients with gingival and periodontal problems
- 2) Root Canal Treated teeth in the arch
- 3) Patients undergoing orthodontic treatment
- 4) Presence of inter-proximal caries or restorations
- 5) Presence of inter-dental spaces

Apparatus used in this study (Fig-1 and Fig-2)

1. Elastomeric separator
2. Kesling separator
3. Kansal separator
4. Dumbbell separator
5. Separator placing plier
6. Straight howe plier
7. Light wire plier
8. Leaf gauge



Fig. 2: Leaf Gauge

evaluated for 5 days for amount of separation, pain perception and loss of separator in each quadrant. After air-spray drying of the maxillary molars, the amount of separation of each maxillary first molar, was measured mesially and distally with a leaf gauge (sensitivity 5/100mm). Pain and discomfort was assessed with the help of visual analogue scale (VAS).



Fig. 3: Separators Placement: A. Kansal separator in maxillary right side B. Dumbbell separator in maxillary left side C. Elastomeric separator in mandibular right side D. Kesling separator in mandibular left side.



Fig. 4: After Separators Placed In: A. Maxillary arch (Right and Left side) B. Mandibular arch (Right and Left side)

Measuring the Separating Effect

The separators were kept for 5 days and the number of times separators were lost, was recorded. The Kansal and Kesling were removed with light wire plier, elastomerics were removed with a curved probe, and dumbbell separator were removed with straight howe

plier. After removal of separators, air-spray drying was done and the amount of separation of each maxillary and mandibular first molar was measured mesially and distally with a leaf gauge (Fig-5). The duration to achieve required separation (0.2 mm) was also noted.



Fig. 5: Amount of separation measurement with leaf gauge

Measurement of Patient Perception of Pain or Discomfort

A questionnaire consisting of 13 questions was given to the patient before and after placement on 1st day, 2nd day, 3rd day, 4th day and before and after removal on 5th day (Table 1). The patients were given written and oral instructions, with an explanation on how to fill the questions. First, an initial survey assessing the baseline perception of pain and discomfort at was done. Then questions regarding pain perception were asked before and immediately after placement of the separators, as

well as once a day at home for the following 3 days. Finally, the two remaining questionnaires were completed on day 5 at the clinic during removing of separators. The questionnaires consisted of 13 questions describing pain and discomfort. 8 questions used a visual analogue scale (VAS), with scores ranging from 0 (no pain) through 5 (Moderate pain) to 10 (Worst possible pain) (Fig 6.) Rest 5 questions had Yes/No as choices and patients were supposed to choose either.

Table 1- Questionnaire

- 1. Do your upper molars (back teeth) hurt when you chew on the right side ?
- 2. Do your upper molars (back teeth) hurt when you chew on the left side?
- 3. Do your lower molars (back teeth) hurt when you chew on the right side ?
- 4. Do your lower molars (back teeth) hurt when you chew on the left side?
- 5. Do your upper molars (back teeth) hurt at rest on the right side ?
- 6. Do your upper molars (back teeth) hurt at rest on the left side ?
- 7. Do your lower molars (back teeth) hurt at rest on the right side ?
- 8. Do your lower molars (back teeth) hurt at rest on the left side ?

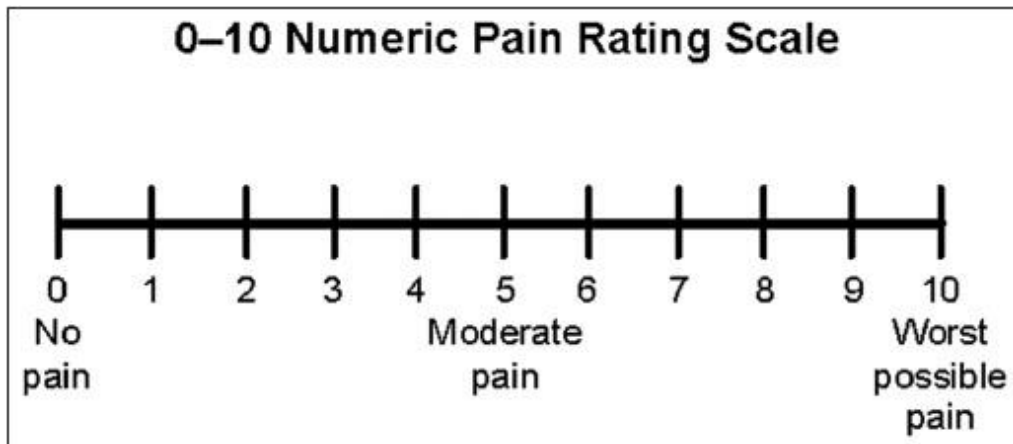


Fig 6: VAS Scale for pain measurement

Five questions had to be answered with fixed answers by choosing Yes or No

1. Has it hurt so much that you have changed your diet to soft food? (Ex.: Yogurt, Banana) Yes / No
2. Has it hurt so much that your leisure activities were influenced? (Ex.: Music, sports, time with friends) Yes / No
3. Has it hurt so much that your schoolwork was influenced? Yes / No
4. Has it hurt so much that you have been awake in the night? Yes / No
5. Has it hurt so much that you had to take pain killers? Yes / No

STATISTICAL ANALYSIS

All statistical analyses were performed using IBM SPSS 23.0. The following calculations were used in the present investigation:

ANOVA ONE-WAY TEST

The One-way ANOVA compares the means of the samples or groups in order to make inferences about the population means.

Post Hoc Test

RESULTS

Post hoc tests are run to confirm where the differences occurred between groups, they should only be run when you have a shown an overall statistically significant difference in group means (i.e., a statistically significant one-way ANOVA result).

Student T Test

A “T” test most commonly applied when the test statistic would follow a normal distribution if the value of a scaling term in the test statistic were know.

Table 2 and 3 shows amount of separation in different types of separators.

| S.No. | Name of separator | N | Mean±SD | P |
|-------|--------------------|----|--------------|------|
| 1. | Dumbbell | 40 | .3663±.07106 | .000 |
| 2. | Kesling | 40 | .2188±.05739 | |
| 3. | Kansal | 40 | .1525±.03387 | |
| 4. | Elastomeric | 40 | .2250±.05189 | |

*. The mean difference is significant at the 0.05 level.

Table 2: Shows amount of separation in different types of separators

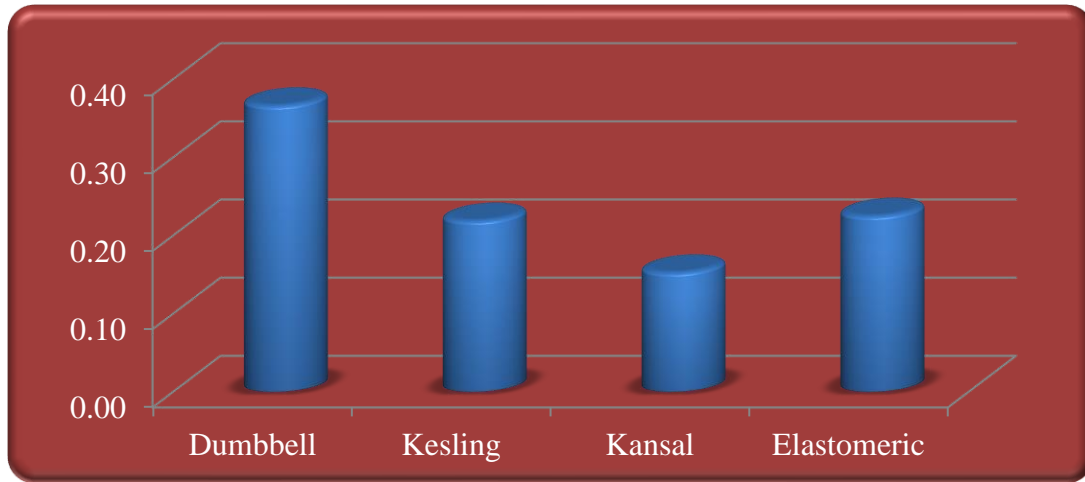
| | | Mean | P |
|--------------------|-------------|----------|------|
| Dumbbell | Kesling | .14750* | .000 |
| | Kansal | .21375* | .000 |
| | Elastomeric | .14125* | .000 |
| Kesling | Dumbbell | -.14750* | .000 |
| | Kansal | .06625* | .000 |
| | Elastomeric | -.00625 | .957 |
| Kansal | Dumbbell | -.21375* | .000 |
| | Kesling | -.06625* | .000 |
| | Elastomeric | -.07250* | .000 |
| Elastomeric | Dumbbell | -.14125* | .000 |
| | Kesling | .00625 | .957 |
| | Kansal | .07250* | .000 |

*. The mean difference is significant at the 0.05 level.

Table 3: Multiple Comparisons in amount of separation in different types of separators

The results show that the amount of separation was significantly different between four type of separators – dumbbell, kesling, kansal and elastomeric. The mean separation was 0.36 mm for dumbbell, 0.21 for

kesling, 0.15 mm for kansal and 0.22 for elastomeric (Table-2). There was no statistically significant difference between elastomeric and kesling (Table-3) (Graph-1).



Graph 1: Shows amount of separation in different types of separators

Table 4 and 5: Show time taken for adequate separation in different types of separation.

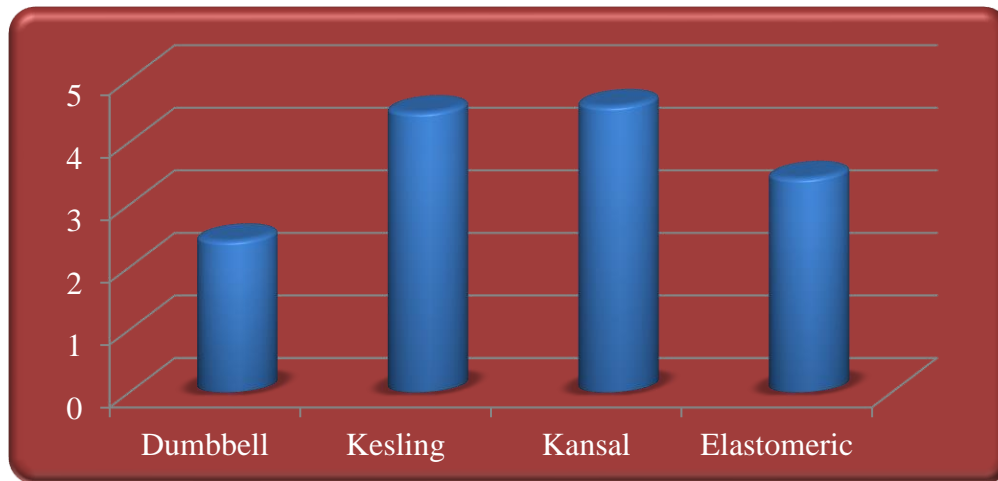
| S.No. | Name of Separator | n | Mean±SD | P |
|-------|-------------------|----|-------------|------|
| 1. | Dumbbell | 40 | 2.425±.5006 | .000 |
| 2. | Kesling | 40 | 4.475±.5057 | |
| 3. | Kansal | 40 | 4.575±.5006 | |
| 4. | Elastomeric | 40 | 3.425±.5006 | |

Table 4: Show time taken for adequate separation in different types of separators

| | | Mean | P |
|--------------------|-------------|----------|------|
| Dumbbell | Kesling | -2.0500* | .000 |
| | Kansal | -2.1500* | .000 |
| | Elastomeric | -1.0000* | .000 |
| Kesling | Dumbbell | 2.0500* | .000 |
| | Kansal | -.1000 | .810 |
| | Elastomeric | 1.0500* | .000 |
| Kansal | Dumbbell | 2.1500* | .000 |
| | Kesling | .1000 | .810 |
| | Elastomeric | 1.1500* | .000 |
| Elastomeric | Dumbbell | 1.0000* | .000 |
| | Kesling | -1.0500* | .000 |
| | Kansal | -1.1500* | .000 |

***. The mean difference is significant at the 0.05 level.**

Table 5: Show Multiple Comparisons in time taken for adequate separation in different types of separators
Adequate separation was considered 0.2 mm because molar band material thickness is .005 inch /0.127 mm. It was found that the time taken for adequate separation was significant in all the 4 separators; dumbbell being the fastest followed by elastomeric separator. There was no significant difference between kesling and kansal separator. The mean of time take for adequate separation was 2.4 days for dumbbell, 4.4 days for kesling, 4.5 days for kansal and 3.4 days for elastomeric separator (Table-4, 5) (Graph-2).



Graph 2: Shows time taken for adequate separation (days) in different types of separators

Table 6: Show pain and discomfort at rest in different types of separators.

| | | N | Mean | SD | P-Value |
|------------------------------|--------------|------------|--------------|---------------|---------|
| Day1_Before placement | Dumbbell | 40 | 0.000 | 0.0000 | |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | 0.000 | 0.0000 | |
| Day1_After placement | Dumbbell | 40 | .500 | .5064 | 0.0000 |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | .125 | .3318 | |
| Day 2 | Dumbbell | 40 | 2.075 | .5256 | 0.0000 |
| | Kesling | 40 | .475 | .5541 | |
| | Kansal | 40 | .375 | .4903 | |
| | Elastomeric | 40 | 1.250 | .5430 | |
| | Total | 160 | 1.044 | .8640 | |
| Day 3 | Dumbbell | 40 | 3.775 | .7334 | 0.0000 |
| | Kesling | 40 | 1.300 | .4641 | |
| | Kansal | 40 | 1.025 | .3572 | |
| | Elastomeric | 40 | 2.325 | .4743 | |
| | Total | 160 | 2.106 | 1.2006 | |

| | | | | | |
|---------------------------|--------------|------------|-------------|--------------|--------|
| Day 4 | Dumbbell | 40 | 1.900 | .5905 | 0.0000 |
| | Kesling | 40 | .450 | .5038 | |
| | Kansal | 40 | .325 | .4743 | |
| | Elastomeric | 40 | 1.250 | .5883 | |
| | Total | 160 | .981 | .8353 | |
| Day5_Before remove | Dumbbell | 40 | .775 | .5768 | 0.0000 |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | .194 | .4415 | |
| Day5_After remove | Dumbbell | 40 | .250 | .4385 | 0.0000 |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | .063 | .2428 | |

Table 7: Show Multiple Comparisons pain and discomfort at rest in different types of separators.

| Tukey HSD | | | | |
|-----------------------------|----------|---------|------------------------------|-------------|
| Dependent Variable | | | Mean Difference (I-J) | Sig. |
| Day1_After placement | Dumbbell | Kesling | .5000* | .000 |

| | | | | |
|-------------|-------------|-------------|----------|---------|
| | | Kansal | .5000* | .000 |
| | | Elastomeric | .5000* | .000 |
| | Kesling | Dumbbell | -.5000* | .000 |
| | | Kansal | 0.0000 | 1.000 |
| | | Elastomeric | 0.0000 | 1.000 |
| | Kansal | Dumbbell | -.5000* | .000 |
| | | Kesling | 0.0000 | 1.000 |
| | | Elastomeric | 0.0000 | 1.000 |
| | Elastomeric | Dumbbell | -.5000* | .000 |
| | | Kesling | 0.0000 | 1.000 |
| | | Kansal | 0.0000 | 1.000 |
| | Day 2 | Dumbbell | Kesling | 1.6000* |
| Kansal | | | 1.7000* | .000 |
| Elastomeric | | | .8250* | .000 |
| Kesling | | Dumbbell | -1.6000* | .000 |
| | | Kansal | .1000 | .833 |
| | | Elastomeric | -.7750* | .000 |
| Kansal | | Dumbbell | -1.7000* | .000 |
| | | Kesling | -.1000 | .833 |
| | | Elastomeric | -.8750* | .000 |
| Elastomeric | | Dumbbell | -.8250* | .000 |
| | | Kesling | .7750* | .000 |
| | | Kansal | .8750* | .000 |

| | | | | |
|-------------|-------------|-------------|----------|------|
| Day3 | Dumbbell | Kesling | 2.4750* | .000 |
| | | Kansal | 2.7500* | .000 |
| | | Elastomeric | 1.4500* | .000 |
| | Kesling | Dumbbell | -2.4750* | .000 |
| | | Kansal | .2750 | .094 |
| | | Elastomeric | -1.0250* | .000 |
| | Kansal | Dumbbell | -2.7500* | .000 |
| | | Kesling | -.2750 | .094 |
| | | Elastomeric | -1.3000* | .000 |
| | Elastomeric | Dumbbell | -1.4500* | .000 |
| | | Kesling | 1.0250* | .000 |
| | | Kansal | 1.3000* | .000 |
| Day 4 | Dumbbell | Kesling | 1.4500* | .000 |
| | | Kansal | 1.5750* | .000 |
| | | Elastomeric | .6500* | .000 |
| | Kesling | Dumbbell | -1.4500* | .000 |
| | | Kansal | .1250 | .731 |
| | | Elastomeric | -.8000* | .000 |
| | Kansal | Dumbbell | -1.5750* | .000 |
| | | Kesling | -.1250 | .731 |
| | | Elastomeric | -.9250* | .000 |
| Elastomeric | Dumbbell | -.6500* | .000 | |

| | | | | | |
|---------------------------|-------------|-------------|---------|-------|--|
| | | Kesling | .8000* | .000 | |
| | | Kansal | .9250* | .000 | |
| Day5_Before remove | Dumbbell | Kesling | .7750* | .000 | |
| | | Kansal | .7750* | .000 | |
| | | Elastomeric | .7750* | .000 | |
| | Kesling | Dumbbell | -.7750* | .000 | |
| | | Kansal | 0.0000 | 1.000 | |
| | | Elastomeric | 0.0000 | 1.000 | |
| | Kansal | Dumbbell | -.7750* | .000 | |
| | | Kesling | 0.0000 | 1.000 | |
| | | Elastomeric | 0.0000 | 1.000 | |
| | Elastomeric | Dumbbell | -.7750* | .000 | |
| | | Kesling | 0.0000 | 1.000 | |
| | | Kansal | 0.0000 | 1.000 | |
| Day5_After remove | Dumbbell | Kesling | .2500* | .000 | |
| | | Kansal | .2500* | .000 | |
| | | Elastomeric | .2500* | .000 | |
| | Kesling | Dumbbell | -.2500* | .000 | |
| | | Kansal | 0.0000 | 1.000 | |
| | | Elastomeric | 0.0000 | 1.000 | |
| | Kansal | Dumbbell | -.2500* | .000 | |
| | | Kesling | 0.0000 | 1.000 | |
| | | Elastomeric | 0.0000 | 1.000 | |
| | Elastomeric | Dumbbell | -.2500* | .000 | |

*. The mean difference is significant at the 0.05 level.

Table 8: Show multiple comparisons in pain and discomfort at rest in different types of separators

| | | N | Mean | Std. Deviation | P-Value |
|------------------------------|--------------|------------|--------------|-----------------------|----------------|
| Day1_Before placement | Dumbbell | 40 | 0.000 | 0.0000 | |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | 0.000 | 0.0000 | |
| Day1_After placement | Dumbbell | 40 | .600 | .4961 | .000 |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | .150 | .3582 | |
| Day 2 | Dumbbell | 40 | 2.425 | .5943 | .000 |
| | Kesling | 40 | .900 | .4961 | |
| | Kansal | 40 | .700 | .4641 | |
| | Elastomeric | 40 | 1.725 | .4522 | |
| | Total | 160 | 1.438 | .8518 | |
| Day 3 | Dumbbell | 40 | 4.750 | .8697 | .000 |

| | | | | | |
|---------------------------|--------------|------------|--------------|---------------|------|
| | Kesling | 40 | 1.775 | .5768 | |
| | Kansal | 40 | 1.475 | .5057 | |
| | Elastomeric | 40 | 2.725 | .4522 | |
| | Total | 160 | 2.681 | 1.4247 | |
| Day 4 | Dumbbell | 40 | 2.475 | .5986 | .000 |
| | Kesling | 40 | .600 | .5905 | |
| | Kansal | 40 | .525 | .5057 | |
| | Elastomeric | 40 | 1.500 | .5547 | |
| | Total | 160 | 1.275 | .9710 | |
| Day5_Before remove | Dumbbell | 40 | .950 | .6385 | .000 |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | .238 | .5199 | |
| Day5_After remove | Dumbbell | 40 | .250 | .4385 | .000 |
| | Kesling | 40 | 0.000 | 0.0000 | |
| | Kansal | 40 | 0.000 | 0.0000 | |
| | Elastomeric | 40 | 0.000 | 0.0000 | |
| | Total | 160 | .063 | .2428 | |

Table 8: Show pain and discomfort at chewing in different types of separators

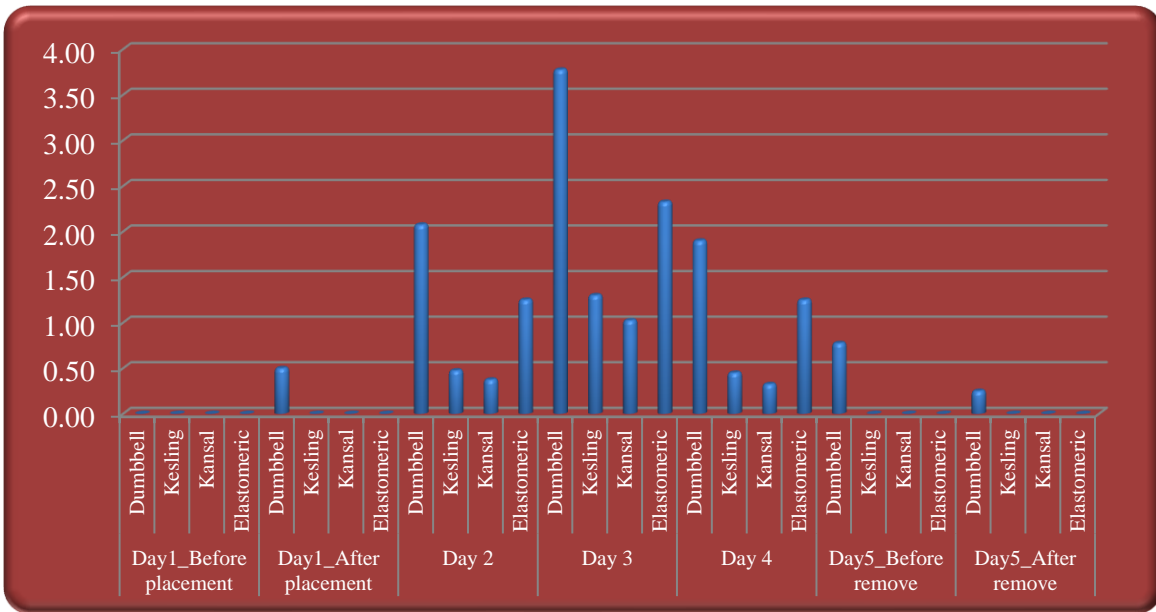
Table 9: Show multiple comparisons in pain and discomfort at chewing in different types of separators.

| Dependent Variable | | | Mean Difference (I-J) | Sig. |
|-----------------------------|-------------|-------------|-----------------------|-------|
| Day1_After placement | Dumbbell | Kesling | .6000* | .000 |
| | | Kansal | .6000* | .000 |
| | | Elastomeric | .6000* | .000 |
| | Kesling | Dumbbell | -.6000* | .000 |
| | | Kansal | 0.0000 | 1.000 |
| | | Elastomeric | 0.0000 | 1.000 |
| | Kansal | Dumbbell | -.6000* | .000 |
| | | Kesling | 0.0000 | 1.000 |
| | | Elastomeric | 0.0000 | 1.000 |
| | Elastomeric | Dumbbell | -.6000* | .000 |
| | | Kesling | 0.0000 | 1.000 |
| | | Kansal | 0.0000 | 1.000 |
| Day 2 | Dumbbell | Kesling | 1.5250* | .000 |
| | | Kansal | 1.7250* | .000 |
| | | Elastomeric | .7000* | .000 |
| | Kesling | Dumbbell | -1.5250* | .000 |

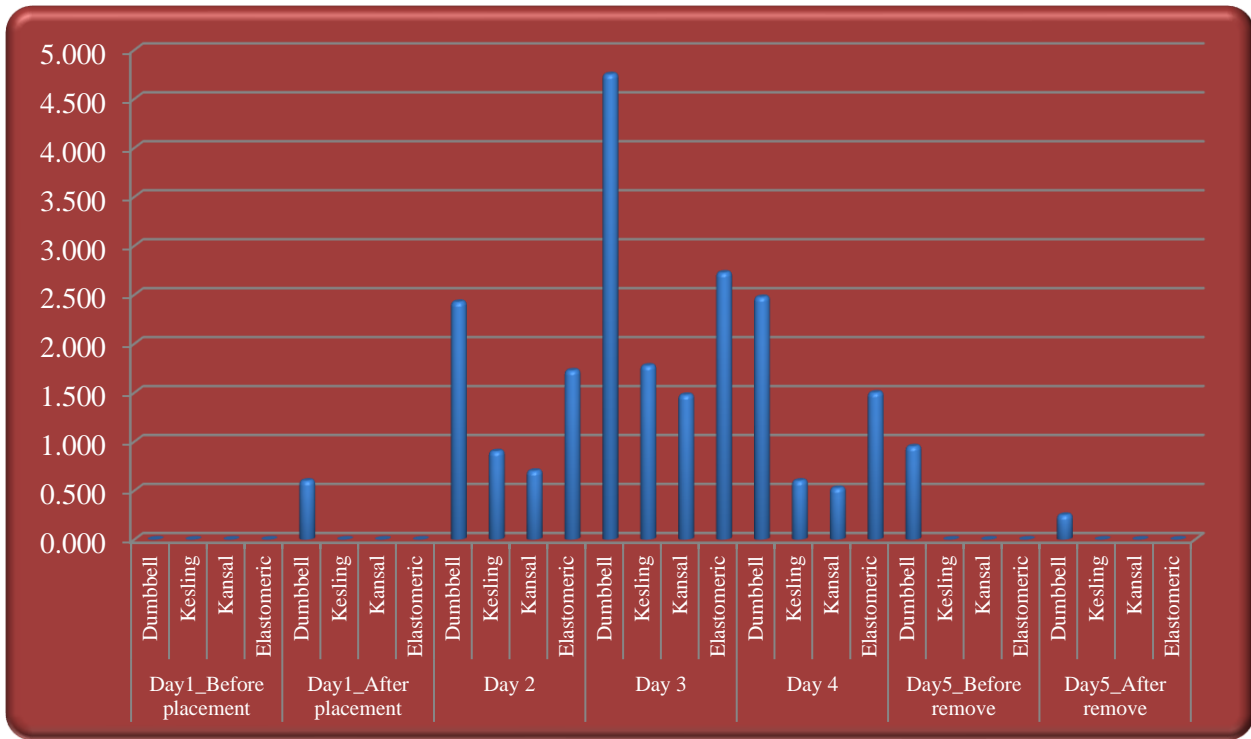
| | | | | | |
|-------------|--------------|-------------|----------|---------|------|
| | | Kansal | .2000 | .291 | |
| | | Elastomeric | -.8250* | .000 | |
| | Kansal | Dumbbell | -1.7250* | .000 | |
| | | Kesling | -.2000 | .291 | |
| | | Elastomeric | -1.0250* | .000 | |
| | Elastomeric | Dumbbell | -.7000* | .000 | |
| | | Kesling | .8250* | .000 | |
| | | Kansal | 1.0250* | .000 | |
| | Day 3 | Dumbbell | Kesling | 2.9750* | .000 |
| | | | Kansal | 3.2750* | .000 |
| Elastomeric | | | 2.0250* | .000 | |
| Kesling | | Dumbbell | -2.9750* | .000 | |
| | | Kansal | .3000 | .140 | |
| | | Elastomeric | -.9500* | .000 | |
| Kansal | | Dumbbell | -3.2750* | .000 | |
| | | Kesling | -.3000 | .140 | |
| | | Elastomeric | -1.2500* | .000 | |
| Elastomeric | | Dumbbell | -2.0250* | .000 | |
| | | Kesling | .9500* | .000 | |
| | | Kansal | 1.2500* | .000 | |

Patients had no pain before placement of separators at rest and at chewing in both maxillary and mandibular arch in all types of separators. Only dumbbell separator was painful throughout, at rest and at chewing at day 1 after placement and day 5 before and after removal. Other three separators were painful at

day 2, 3, 4 both at rest and at chewing. Pain was more in all the separators on chewing than rest position from day 1 to day 5. Statistically significant difference between all four type of separators at rest and chewing is shown in table 6, 7, 8, 9 and graph 3, 4.



Graph 3: Show pain and discomfort at rest in different types of separators



Graph 4: Show pain and discomfort at chewing in different types of separators

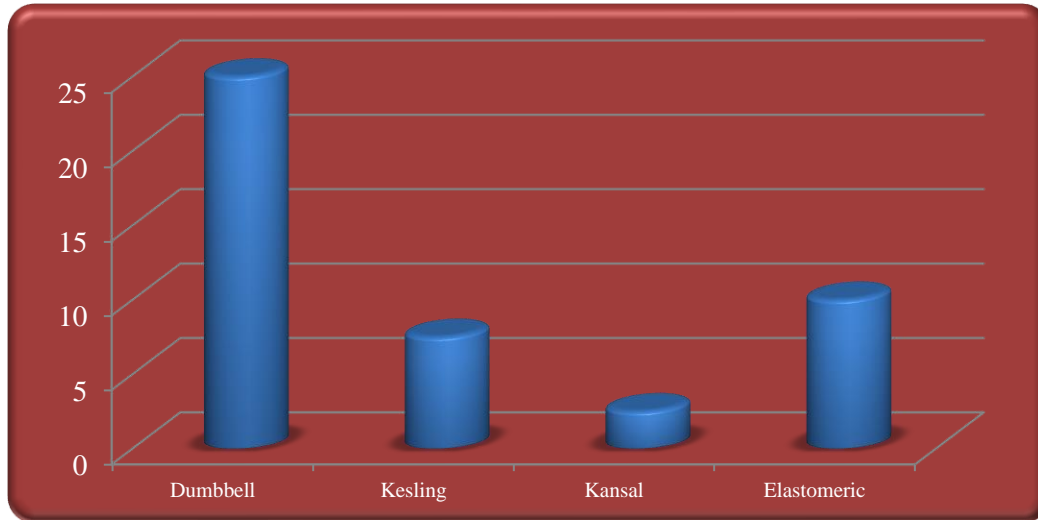
Table 10: Shows the percentage of patients in whom the separator lost and percentage of separator lost.

| Name of separator | No. of patients in whom the separator lost | | Total No. of separator lost | |
|-------------------|--|-----|-----------------------------|------|
| | No. | % | No. | % |
| Dumbbell | 10 | 25 | 16 | 20 |
| Kesling | 3 | 7.5 | 4 | 5 |
| Kansal | 1 | 2.5 | 1 | 1.25 |

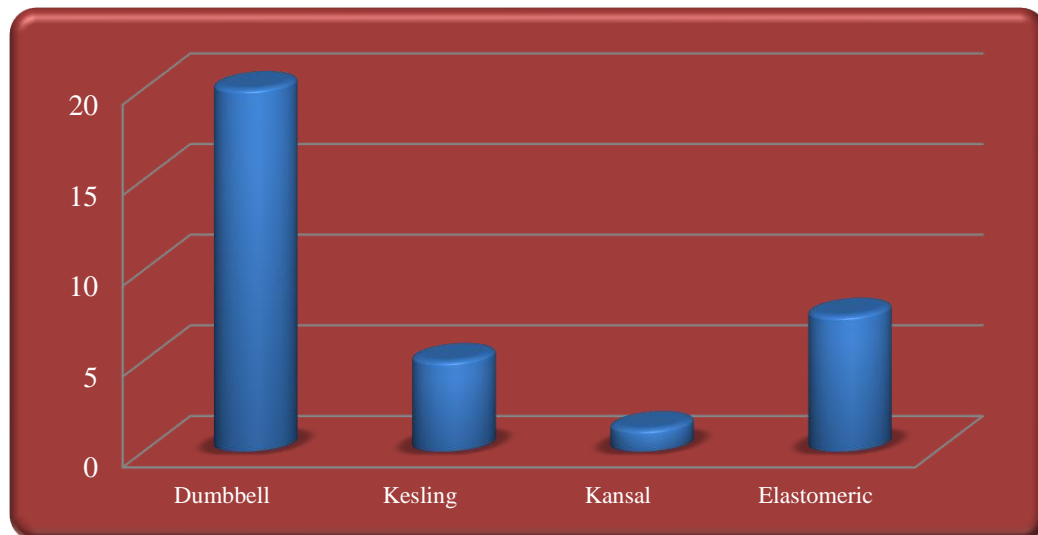
| | | | | |
|--------------------|---|----|---|-----|
| Elastomeric | 4 | 10 | 6 | 7.5 |
|--------------------|---|----|---|-----|

The study shows that total 27 separators were lost; 16 dumbbell, 4 kesling, 1 kansal and 6 elastomeric separator. Dumbbell separator showed (20%) highest

frequency of loss and kansal separator the least (1.25%) (Table-10) (Graph-5, 6).



Graph 5: Shows the percentage of patients in whom the separator lost



Graph 6: Shows the percentage of separator lost

DISCUSSION

Pain and discomfort are most common chief complaint of patient during separation period. It was found that

the amount of separation by dumbbell separator was significant at day 1 to day 5 compared to three other separators. This was in agreement with the study done by **Malagan et al¹** where a significant difference was observed between four type of separators; elastomeric, kesling, dumbbell and NEET spring on day 1,2 and 3. In our study the amount of separation of elastomeric separator was 0.2 mm. This separation value is more

than the earlier study done by **Hoffmann**⁶. Our result also showed statistically significant difference between the separation effect of elastomeric, Dumbbell, kesling and kansal separator.

Elastomeric separators also showed statistically significant amount of separation in comparison with kesling and kansal on all five days which was similar to previous study done by **Cureton and Ronald**⁷. In our study reliability of elastomeric separators, 7.5% were lost which was in contrast to above study.

In the present study, Dumbbell separators provided fastest and greater amount of separation than the elastomeric, kesling and kansal separator. However, 20% of dumbbell separators were lost which was very high compared to other separators. This was in agreement with the study done by **Malagan M et al**¹. In this study the dumbbell separator provided fastest and more amount of separation than the other 4 types of separators and frequency of loss of separator was 16%, which was highest among other separators.

In this study, the VAS was used to measure the pain /discomfort level. VAS is a useful tool for pain perception of patient. The pain and discomfort of patient at 1st to 5th day by dumbbell separator was more than other three separators. This was, again, in agreement with the study done by **Malagan M et al**¹. Kesling separator was easy to place in tight contact point and frequency of loss of separator is less than the dumbbell and elastomeric due to engagement of the opposite embrasure area. Pain perception was more at chewing than at rest position in all four types of separators at 1st to 5th days. This result is in agreement with **Bondemark et al**² study. In our study the pain was worst at 2 and 3 day and gradually decreased at 4th and 5th day. This result agrees with **Bondemark et al**² study. In the present study the elastomeric separator was more painful than the kesling and kansal separator; similar to earlier study done by **Nalbantgil et al**³ in which the elastomeric separators was more painful than the brass wire separators. Also loss of elastomeric separator in the above study was more than the brass wire separator but in our study the frequency of loss of elastomeric separator was more

than the kesling and kansal separator but less than the dumbbell separator.

In our study, adequate separation of elastomeric separation was 3.4 days but in a previous study done by **Juneja et al**⁸, the adequate separation of elastomeric separation was 2 days after placement of separator.

In the present study the separation and discomfort caused by elastomeric was more than the kesling separator and similar result are shown in a previous study done by **Sandhu G P**⁹.

A study conducted by **Bothra et al**¹⁰ shows that the loss of “elastomeric” separator is significantly higher than the “kansal” separators. Similarly, in the present study, the Elastomeric separators were lost significantly more than kansal separators. **Kapoor K et al**¹¹ conducted a study showed pain of mild to moderate intensity with elastomeric and Kesling separators but less painful than the brass wire separator. But the difference was not statistically significant. But in our study statically significant difference in pain was noted in kesling and elastomeric, but, less than the dumbbell separator.

In our study the pain associated with separators started after placement and peaked at 2 and 3 day and subsided on fifth day. This result is similar to previous study done by **Asiry, M A et al**¹² where the pain associated with orthodontic separation started and peaked within 4-48 hours from separator placement, then started to decline to reach the lowest level on fifth day. According to our study, adequate separation was achieved in 2.4 days for dumbbell, 4.4 days for kesling, 4.5 days for kansal and 3.4 days for elastomeric separator. Thus, according to this study, molar band fits easily at least 4 days after placement of separator. Eating was most affected during the separation period, thus, patients had to change to the soft food, like yogurt, banana etc. These finding are same as **Scheurer et al**¹³ study.

Thus, elastomeric separator is less painful than the dumbbell separator and short duration to achieve adequate separation than kesling and kansal separator.

CONCLUSIONS

The following conclusions can be drawn from the present study:

1. All four separators showed significant amount of separation on days 1st, 2nd, 3rd, 4th and 5th day respectively.
2. The time taken for adequate separation was 2.4 days for dumbbell, 4.4 days for kesling, 4.5 days for kansal and 3.4 days for elastomeric separator.
3. Only dumbbell separator was painful throughout at rest and at chewing. Other three separators were painful at day 2, 3, 4 both at rest and at chewing. Pain was more in all the separators on chewing than rest position from day 1 to day 5.
4. Dumbbell separator showed (20%) highest frequency of loss and kansal separator the least (1.25%).

REFERENCES

1. Malagan MA, Biswas P P, Muddaiah S, Reddy R, Shetty BK, Preetham J, Naduwinmani S, Singh S et al. Comparison Between Efficacy of Four Different Types of Orthodontic Separators. *J Clin Diagn Res.* 2014 ; 8(8): 41-4.
2. Bondemark L, Fredriksson K, Llos S. Separation effect and Perception of pain and discomfort from two types of orthodontic separators. *World J Orthod* 2004;172-76.
3. Nalbantgil D, Cakan DG, Oztoprak MO, Arun T. Perception of pain and discomfort during tooth separation. *Aust Orthod J* 2009;25(2).110-15.
4. Goh SY, Siew TB, Mathew T. Perception of Pain for Different Orthodontic Elastomeric Separators. *J Pharm Biomed Sci* 2015; 5(4): 332-37.
5. Tarvade S. Separators in Orthodontics: A Review. *Orthodontic Journal of Nepal* 2016; 6(1): 37-40.
6. Hoffman WE. A study of four types of orthodontic separators. *Am J Orthod Dentofacial Orthop* 1972: 67-73.
7. Cureton SL, Bice RW. Comparison of Three Types of Separators in Adult Patients. *J clin Orthod* 1997 ;31(3):172 - 77.
8. Juneja A, Bagga DK, Sharma R, Sharma P.A comparative evaluation of separation effect and perception of pain using two different orthodontic separators. *J Ind Orthod Soc* 2011;45(4):183-88.
9. Sandhu GP, Kanase A, Naik C R, Pupneja P, Sudan S. Separation effect and perception of pain and discomfort from three types of orthodontic separators. *J Ind Orthod Soc* 2013;47(1):6-9.
10. Bothra J, Bahar K, Pachori Y, Madhu K, Mutha A, Choudhary S. Comparison of dislodgment between two different types of orthodontic separators: An In vivo study. *IOSR Journal of Dental and Medical Sciences.*2017;16(5):112-15.
11. Kapoor P, Singh H, Ghai GS, Ghai GK. Perception Of Pain And Discomfort From three types Of Orthodontic Separators. *Indian J Dent* 2013;5(4):9-11.
12. Asiry MA, Albarakati SF, Al-Marwan, MS, Al-Shammari, RR. Perception of pain and discomfort from elastomeric separators in Saudi adolescents. *Saudi Med J* 2014; 35 (5) :504-7.
13. Scheurer P, Firestone A, Burgin W. Perception of pain as a result of orthodontic treatment with fixed appliance. *Eur J Orthod* 1996; 18:349-357.